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HDP/SB/21 based on PTO/SB/21 (08-00)

TRANSMITTAL FORM

(To be used for all correspondence after initial filing)

Application Number	**09/964,893**
Filing Date	September 28, 2001
Inventor(s)	Claud Erdmann FURST et al.
Group Art Unit	2615
Examiner Name	Xu Mei
Attorney Docket Number	45900-000664/US

ENCLOSURES *(check all that apply)*

- ☒ Fee Transmittal Form
  - ☒ Fee Attached
- ☐ Amendment
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Response to Missing Parts/ Incomplete Application
- ☐ Response to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Assignment Papers *(for an Application)*
- ☐ Letter to the Official Draftsperson and _____ Sheets of Formal Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert to a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s) _____
- ☐ After Allowance Communication to Group
- ☐ LETTER SUBMITTING APPEAL BRIEF AND APPEAL BRIEF (w/clean version of pending claims)
- ☒ Appeal Communication to Group *(Notice of Appeal, **Brief**, Reply Brief)*
- ☐ Proprietary Information
- ☐ Status Letter
- ☐ Other Enclosure(s) *(please identify below)*:

Remarks

MAIL STOP: APPEAL BRIEF - PATENT

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Harness, Dickey & Pierce, P.L.C.	Attorney Name John A. Castellano	Reg. No. 35,094
Signature			
Date	April 28, 2008		

JAC/CDW:psy

FEE TRANSMITTAL for FY 2008

Effective 2/8/2006. Patent fees are subject to annual revision.

☒ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 10

Complete if Known	
Application Number	09/964,893
Filing Date	September 28, 2001
First Named Inventor	Claus Erdmann FURST et al.
Examiner Name	Xu Mei
Art Unit	2615
Attorney Docket No.	45900-000664/US

METHOD OF PAYMENT *(check all that apply)*

☒ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☐ Deposit Account:

Deposit Account Number: 08-0750

Deposit Account Name: Harness, Dickey & Pierce, PLC

The Director is authorized to: *(check all that apply)*
☐ Charge fee(s) indicated below ☒ Credit any overpayments
☒ Charge any additional fee(s) during the pendency of this application
☐ Charge fee(s) indicated below, **except for the filing fee** to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1011	310	2011	155	Utility filing fee	
1012	210	2012	105	Design filing fee	
1013	210	2013	105	Plant filing fee	
1014	310	2014	155	Reissue filing fee	
1005	210	2005	105	Provisional filling fee	

SUBTOTAL (1) ($) 0

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

			Extra Claims		Fee from below		Fee Paid
Total Claims	25	-34 ** =	0	X		=	0
Independent Claims	6	-7 ** =	0	X		=	0
Multiple Dependent						=	0

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	50	2202	25	Claims in excess of 20
1201	210	2201	105	Independent claims in excess of 3
1203	370	2203	185	Multiple dependent claim, if not paid
1204	210	2204	105	** Reissue independent claims over original patent
1205	50	2205	25	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0

***or number previously paid, if greater; For Reissues, see above*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	120	2251	60	Extension for reply within first month	
1252	460	2252	230	Extension for reply within second month	
1253	1,050	2253	525	Extension for reply within third month	
1254	1,640	2254	820	Extension for reply within fourth month	
1255	2,230	2255	1,115	Extension for reply within fifth month	
1401	510	2401	255	Notice of Appeal	
1402	510	2402	255	Filing a brief in support of an appeal	
1403	1,030	2403	515	Request for oral hearing	
1452	510	2452	255	Petition to revive – unavoidable	
1453	1,540	2453	770	Petition to revive – unintentional	
1462	400	1462	400	Petition fee under 37 CFR 1.17(f)	
1463	200	1463	200	Petition fee under 37 CFR 1.17(g)	
1464	130	1464	130	Petition fee under 37 CFR 1.17(h)	
1807	50	1807	50	Processing fee under 37 CFR 1.17 (q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	810	2809	405	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	810	2810	405	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	810	2801	405	Request for Continued Examination (RCE)	
				Other fee (specify) Difference between $500 Fee previously paid Appeal Brief and $510 fee for present Appeal Brief	10

*Reduced by Basic Filing Fee Paid SUBTOTAL (3) ($)10

4. SEARCH/EXAMINATION FEES

1111	510	2111	255	Utility Search Fee
1112	100	2112	50	Design Search Fee
1113	310	2113	155	Plant Search Fee
1114	510	2114	255	Reissue Search Fee
1311	210	2311	105	Utility Examination Fee
1312	130	2312	65	Design Examination Fee
1313	160	2313	80	Plant Examination Fee
1314	620	2314	310	Reissue Examination Fee

SUBTOTAL (4) ($)0

SUBMITTED BY *Complete (if applicable)*

Name (Print/Type)	John A. Castellano	*Registration No. (Attorney/Agent)*	35,094	*Telephone*	(703) 668-8000
Signature				*Date*	April 28, 2008

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PATENT

IN THE U.S. PATENT AND TRADEMARK OFFICE

Appellants:	Claus Erdmann FURST et al.
Application No.:	**09/964,893**
Art Unit:	2615
Filed:	September 28, 2001
Examiner:	Xu Mei
For:	MICROPHONE UNIT WITH INTERNAL A/D CONVERTER
Atty. Dkt. No.:	45900-000664/US
Conf. No.:	1329

Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22313
Mail Stop **Appeal Brief – Patent**

April 28, 2008

APPELLANTS' BRIEF ON APPEAL UNDER 37 C.F.R. §41.37

Sir:

Appellants submit herewith a Brief on Appeal as required by 37 C.F.R. § 41.37 along with the appropriate governmental fees as required by 37 C.F.R. §41.20(b)(2).

Adjustment date: 04/29/2008 CCHAU1
08/29/2007 MAHMED1 00000094 09964893
01 FC:1402 -500.00 OP

04/29/2008 CCHAU1 00000088 09964893
01 FC:1402 510.00 OP

TABLE OF CONTENTS

BRIEF ON BEHALF OF APPELLANTS

In support of the Notice of Appeal filed on February 27, 2008, appealing the Examiner's rejection of each of pending claims 1, 5, 7, 17, 18, 36 and 38 of the present application in the Office Action (hereinafter "Action") mailed on November 27, 2007, Appellants hereby provide the following remarks. A listing of the appealed claims 1, 5, 7, 17, 18, 36 and 38 is provided in the *Claims Appendix*.

I. REAL PARTY IN INTEREST

The real party in interest is Techtronic A/S, the assignee of record, as evidenced by the Assignment recorded at Reel 012448 and Frame 0036.

II. RELATED APPEALS AND INTERFERENCES

Appellants' legal representative is aware of no prior, or pending, appeals or interferences that may be related to, directly affect, be directly affected by, or have any bearing on the Board of Patent Appeals and Interferences (hereinafter "the Board") decision in the Appeal.

III. STATUS OF CLAIMS

Claims 1, 5, 7, 17, 18, 36 and 38 are pending in the current application with claim 1 being written in independent form. Claims 6, 8-14, 26-34 and 37 have been withdrawn. Claims 2-4, 15, 16, 19-25 and 35 have been cancelled.

Appellants are appealing the rejection to claims 1, 5, 7, 17, 18, 36, each of which has been twice rejected.

IV. STATUS OF AMENDMENTS

Appellants submit that no amendments have been made subsequent to the rejection made in the Action mailed on November 27, 2007. Appellants submit that no amendments have been filed after the Notice of Appeal filed on February 27, 2008.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 is reproduced below and includes footnotes indicating where support, at least, for the claimed features is found in Appellants' originally-filed Specification and/or the original drawings.

Independent claim 1 recites a microphone assembly[1] including a microphone assembly casing[2] having a sound inlet port[3], a transducer[4] for receiving acoustic waves through the sound inlet port, and for converting received acoustic waves to analog audio signals, said transducer being positioned within the microphone assembly casing, an electronic circuit[5] positioned within the microphone assembly casing, said electronic circuit comprising a signal path defined by a cascade of a pre-amplifier[6] for amplifying analog audio signals from the transducer, and a sigma-delta modulator[7] for providing digital audio signals, wherein the microphone assembly further comprises filter means[8] in the signal path between the pre-amplifier and the sigma-delta modulator, the filter means preventing low frequency components from reaching the sigma-delta modulator.

Referring to Fig. 2, example embodiments provide a microphone assembly (103) including a high-pass filter (109) connected between microphone pre-amplifier (110) and A/D converter (112), which preferably is a sigma-delta modulator.[9] The high-pass filter (109) blocks DC components in the signals between microphone pre-amplifier (110) and A/D converter (112).[10] The high-pass filter (109) also reduces the overall noise level in the microphone assembly (103) by filtering out low frequencies.[11] An additional amplifier (not shown) may be connected between high-pass filter (109) and A/D converter.[12] This additional amplifier may be a buffer or a differential converter, such as a single-ended to differential converter.[13]

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[1] Reference Nos. 3, 103, 203, 303 and 403 in Figs. 1, 2, 3, 4 and 5, respectively; Specification, p. 8, ll. 13-20.
[2] Reference Nos. 4, 104, 204, 304 and 404 in Figs. 1, 2, 3, 4 and 5, respectively; Specification, p. 8, ll. 15-22.
[3] Reference Nos. 6, 106, 206, 306 and 406 in Figs. 1, 2, 3, 4 and 5, respectively; Specification, p. 8, l. 24.
[4] Reference Nos. 8, 108, 208, 308 and 408 in Figs. 1, 2, 3, 4 and 5, respectively; Specification, p. 8, ll. 24-30.
[5] Line extending from transducer 8 to pre-amplifier 10 and from pre-amplifier 10 to microphone assembly casing 4 in Fig. 1.
[6] Reference Nos. 10, 110, 210 and 310 in Figs. 1, 2, 3 and 4, respectively; Specification, p. 8, ll. 28-31.
[7] Reference Nos. 12, 112, 212 and 312 in Figs. 1, 2, 3 and 4, respectively; Specification, p. 8, l. 33-p. 9, l. 2.
[8] Reference No. 109 in Fig. 1; Specification, p. 9, ll. 26-31.
[9] Specification, p. 9, ll. 26-28.
[10] Specification, p. 9, ll. 28-30.
[11] Specification, p. 9, ll. 30-31.
[12] Specification, p. 9, ll. 31-32.
[13] Specification, p. 9, ll. 32-34.

According to other example embodiments, a low-pass filter (not shown) may be connected between pre-amplifier (110) and A/D converter (112).[14] This low-pass filter prevents undesired aliasing effects by limiting the frequency content of the signals before they are provided to A/D converter (112).[15] High-pass filter (109) and low-pass filter are preferably incorporated into the microphone pre-amplifier (110) though, alternatively, high-pass filter (109) and low-pass filter may optionally be separate from the microphone pre-amplifier (110).[16] The digital output signals on a line (120) are preferably raw signals in the sense that they have not been formatted according to any standard audio format.[17] The preferred raw digital output signals on another line are transmitted to the pure digital DSP (114) for further digital processing.[18]

The high-pass filter (109) typically includes a capacitor (not shown) and a resistor (not shown).[19] The filtering effect of high-pass filter (109) is minimized by selecting capacitor and resistor values making τ as large as possible, or in other words, ensure a very low cut-off frequency of the high-pass filter.[20] Furthermore, it is essential to minimize the noise from the high-pass filter (109) itself.[21] This may be achieved by selecting as large capacitance (*e.g.*, 8 μF) as practical since the electronic noise from a capacitor is given by kT/C, where C is the capacitance, T is the temperature and k Planck's constant.[22] It is clear that the electronic noise from the capacitor increases with a smaller capacitance.[23]

The characteristics of high-pass filter (109) may be designed by taking into consideration the design of the transducer (108) receiving the acoustic signals.[24] For example, by introducing a small pressure equalization opening in the flexible diaphragm of the transducer (108), the cut-off frequency of the acoustic high-pass filter may be lowered down to, for example, 50 Hz.[25] With such a low cut-off frequency, the high-pass filter (109) may be designed with a smaller capacitor without increasing the total noise from the

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[14] Specification, p. 10, ll. 1-2.
[15] Specification, p. 10, ll. 2-3.
[16] Specification, p. 10, ll. 3-6.
[17] Specification, p. 10, ll. 6-7.
[18] Specification, p. 10, ll. 7-9.
[19] Specification, p. 10, l. 12.
[20] Specification, p. 10, ll. 12-15.
[21] Specification, p. 10, l. 15.
[22] Specification, p. 10, ll. 15-18.
[23] Specification, p. 10, ll. 18-19.
[24] Specification, p. 10, ll. 21-22.
[25] Specification, p. 10, ll. 22-24.

microphone.[26] However, it may still be necessary to remove frequencies below 200 Hz electronically so as to avoid overloading the microphone.[27] For this reason high-pass filter (109) may advantageously be designed with a cut-off frequency of around 200 Hz.[28] Following this approach, the acoustic noise from the microphone is minimized.[29] Noise leaking the acoustic high-pass filter may be filtered out by high-pass filter (109).[30] Removal of the lower frequencies electronically using high-pass filter (109) results in a lower total noise and better matching of the low cut-off frequency.[31]

The immediate result achieved following the above-mentioned design route is that the physical dimensions the capacitor may be significantly reduced which also means that the overall size of the microphone assembly (103) may be reduced.[32] This size issue is of specific importance in the area of hearing aids.[33]

Referring to Fig. 3, alternative microphone assembly (203) includes a microphone casing (204) that includes transducer (208), a microphone pre-amplifier (210), an A/D converter (212), and a digital filter (215) in accordance with other example embodiments.[34] The A/D converter (212) is preferably a sigma-delta modulator, and the microphone pre-amplifier (210) may optionally include either a high-pass filter (not shown) or a low-pass filter (not shown) or both.[35] The digital filter (215) removes the high frequency noise from the digital bit stream.[36] For example, the digital filter (215) is preferably a digital decimation low-pass filter, which removes out-of-band quantization noise.[37] The digital filter (215) may be incorporated within the microphone casing (204), or in a pure digital DSP (214) outside the microphone casing (204).[38] Whether the digital filter (215) is incorporated in the A/D converter (212) or in the pure digital DSP (214) will depend on size constraints, for example.[39]

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[26] Specification, p. 10, ll. 24-26.
[27] Specification, p. 10, ll. 26-27.
[28] Specification, p. 10, ll. 28-29.
[29] Specification, p. 10, l. 29.
[30] Specification, p. 10, l. 30.
[31] Specification, p. 10, ll. 30-32
[32] Specification, p. 10, l. 34 – p. 11, l. 1.
[33] Specification, p. 11, ll. 1-2.
[34] Specification, p. 11, ll. 4-7.
[35] Specification, p. 11, ll. 7-9.
[36] Specification, p. 11, ll. 9-10.
[37] Specification, p. 11, ll. 10-12.
[38] Specification, p. 11, ll. 12-14.
[39] Specification, p. 11, ll. 15-16.

Referring to Fig. 4, example embodiments provide a microphone assembly (303) with a formatting circuit (313) connected between an A/D converter (312) and a pure digital DSP (314).[40] The formatting circuit (313) formats the signals from the A/D converter (312) in accordance with a digital audio standard, such as, for example, S/PDIF, AES/EBU, I^2S, or any other suitable digital audio standard.[41] Alternatively, the formatting may be performed by the pure digital DSP (314).[42] The formatting circuit (313) is preferably incorporated into the A/D converter (312) within a microphone casing (304), and may further include a digital filter (not shown).[43] The pre-amplifier (310) may optionally include a high-pass filter (not shown) and/or a low-pass filter (not shown).[44] The formatted digital output signals may be transmitted on a line (320) to the pure digital DSP (314) for further processing or, because the digital output signals are formatted according to a digital audio standard, may be plugged into or incorporated directly into a device which is compliant with such digital audio standard, such as a portable audio or video device, for example.[45]

Referring to Fig. 5, example embodiments also provide a microphone assembly (403) having an integrated circuit (IC) (405) connected between transducer (408) and a pure digital DSP (414).[46] The IC (405) is located within a microphone assembly casing (404) and includes a microphone pre-amplifier (not shown) and an A/D converter (not shown), which is preferably a sigma-delta modulator.[47] Depending on the application, the IC (405) may further include any one or combination of the following components: the high-pass filter (not shown), the low-pass filter (not shown), the additional amplifier (not shown), the digital filter (not shown), or the formatting circuit (not shown).[48] Size constraints of the microphone may dictate how many additional components are incorporated on the IC (405).[49] The analog audio signals from transducer (408) are provided to the IC (405) which outputs either raw or formatted digital output signals on a line (420) to the pure digital DSP (414).[50]

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[40] Specification, p. 11, ll. 18-20.
[41] Specification, p. 11, ll. 20-22.
[42] Specification, p. 11, ll. 22-23.
[43] Specification, p. 11, ll. 23-25.
[44] Specification, p. 11, ll. 25-27.
[45] Specification, p. 11, ll. 27-31.
[46] Specification, p. 11, ll. 33-34.
[47] Specification, p. 11, l. 34 – p. 12, l. 1.
[48] Specification, p. 12, ll. 1-5.
[49] Specification, p. 12, ll. 5-6.
[50] Specification, p. 12, ll. 6-8.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Appellants requests the Board's review of the rejection of claims 1, 5, 7, 17, 18, 36 and 38 under 35 U.S.C. § 103(a) as being unpatentable over Martin, U.S. Patent No. 5,796,848 in view of Arndt et al., U.S. Patent No. 6,421,448.

VII. ARGUMENTS

A. 35 U.S.C. §103(a) REJECTION – MARTIN AND ARNDT

Appellants submit that claims 1, 5, 7, 17, 18, 36 and 38 are allowable for features present in each claim. Appellants submit that the claims are argued in one group, which includes claims 1, 5, 7, 17, 18, 36 and 38, which rise and fall together, with claim 1 being representative.

i. GROUP I: CLAIMS 1, 5, 7, 17, 18, 36 AND 38

In view of the following arguments, Appellants submit that Martin in view of Arndt, as relied upon by the Examiner, fails to teach, or suggest, a microphone assembly including a "filter means in the signal path between the pre-amplifier and the sigma-delta modulator, the filter means preventing low frequency components from reaching the sigma-delta modulator" as recited in independent claim 1.

Namely, the Examiner acknowledges that "Martin does not disclose the microphone assembly further comprises filter means in the signal path between the pre-amplifier and the sigma-delta modulator to prevent low frequency components from reaching the sigma-delta modulator."[51] The Examiner then relies on Arndt to cure the deficiencies of Martin. However, Appellants submit that the combination of Martin and Arndt is improper for the following reasons.

a. Function of Arndt's High-Pass Filter and Microphone

The Examiner asserts that "Arndt discloses having [a] high pass filter subsequent to [a] microphone contain[ing] a coupling capacitor and a resistor is a customary circuit for coupling a microphone signal into an amplifier circuit of a hearing device (see Col. 4, lines

[51] Action, p. 3.

35-40). And it is inherent for such customary high pass filter to prevent or attenuate low frequency components of the microphone input signal."[52]

However, MPEP §2112(IV) states,

> **"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art."** *Ex parte Levy,* 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original) (Applicant's invention was directed to a biaxially oriented, flexible dilation catheter balloon (a tube which expands upon inflation) used, for example, in clearing the blood vessels of heart patients). The examiner applied a U.S. patent to Schjeldahl which disclosed injection molding a tubular preform and then injecting air into the preform to expand it against a mold (blow molding). The reference did not directly state that the end product balloon was biaxially oriented. It did disclose that the balloon was "formed from a thin flexible inelastic, high tensile strength, biaxially oriented synthetic plastic material." *Id.* at 1462 (emphasis in original). The examiner argued that Schjeldahl's balloon was inherently biaxially oriented. The Board reversed on the basis that the examiner did not provide objective evidence or cogent technical reasoning to support the conclusion of inherency.).
>
> Emphasis Added.

Appellants submit that the Examiner has not provided any factual, or technical, reasoning that supports the Examiner's finding that the allegedly inherent characteristics of the high-pass filters 30 and '30 in Arndt necessarily flow from the teachings in Arndt.

MPEP §2112 also states,

> **The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic**. *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) (reversed rejection because inherency was based on what would result due to optimization of conditions, not what was necessarily present in the prior art); *In re Oelrich*, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981). **"To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.' "** *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (citations omitted) (The claims were drawn to a disposable diaper having three fastening elements. The reference disclosed two fastening elements that could

[52] Action, p. 3 (emphasis added).

> perform the same function as the three fastening elements in the claims. The court construed the claims to require three separate elements and held that the reference did not disclose a separate third fastening element, either expressly or inherently.).
>
> Emphasis Added.

For the reasons discussed below, Appellants submit that the high-pass filters 30 and '30 in Arndt do not inherently prevent "low frequency components from reaching the sigma-delta modulator" as claimed in independent claim 1.

In the Office Action mailed on March 8, 2007 and referencing column 2, line 39-42 of Arndt, the Examiner asserts Arndt teaches that "[t]he small hole(s) in the membrane of the microphone(s) [disclosed] by Arndt is used to cause the shift of each of the microphones (3, 3', 30, 30') to reach its limit frequency, which is about 100 Hz (per col. 2, line 41). ***The high pass filters themselves (i.e., 3, 3', 30, 30') are used to suppress these interference signals of low frequency received by the microphones*** (emphasis added)."[53] Appellants respectfully disagree for the reasons discussed below.

Arndt is directed to a hearing aid device having a directional microphone characteristic produced by at least two microphones of the same type that deviate from one another in their signal transmission behavior.

Arndt teaches, "[m]icrophones customarily used in hearing aid devices nowadays represent acoustic high-pass filters in their signal transmission behavior."[54] Thus, the signal transmission behavior of microphones in hearing aid devices mimics the signal transmission behavior of acoustic high-pass filters.

Comparing the microphones in hearing aid devices to acoustic high-pass filters, Arndt teaches that "[t]he limit frequency of such a high-pass filter, i.e. the frequency at which the magnitude of the output signal divided by the magnitude of the input signal equals -3dB, is about 100Hz. To reach this limit frequency, each of the microphones used has a small hole in its membrane, causing the limit frequency—dependent on the diameter of this hole in the membrane—to be shifted to higher values."[55] Therefore, the small hole in the membrane of the microphone causes the limit frequency to shift.

Furthermore, "[t]his shift is necessary to suppress interference signals of lower frequency, as occur in a car, for example, which otherwise could easily lead to over

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[53] Office Action mailed on March, 8, 2007, p. 5.
[54] Arndt, col. 2, ll. 37-39.
[55] Arndt, col. 2, ll. 39-46 (emphasis added).

amplification in the hearing aid device."[56] In other words, the shift in the limit frequency caused by the small hole in the membrane of the microphone suppresses the lower frequency interference signals. That is, the function of the small hole in the membrane of the microphone is to suppress the lower frequency interference signals.

Accordingly, referring to FIG. 2 (reproduced below), the lower frequency interference signals traveling through the microphone equivalent circuit are suppressed prior to reaching the high-pass filters 30 and '30.

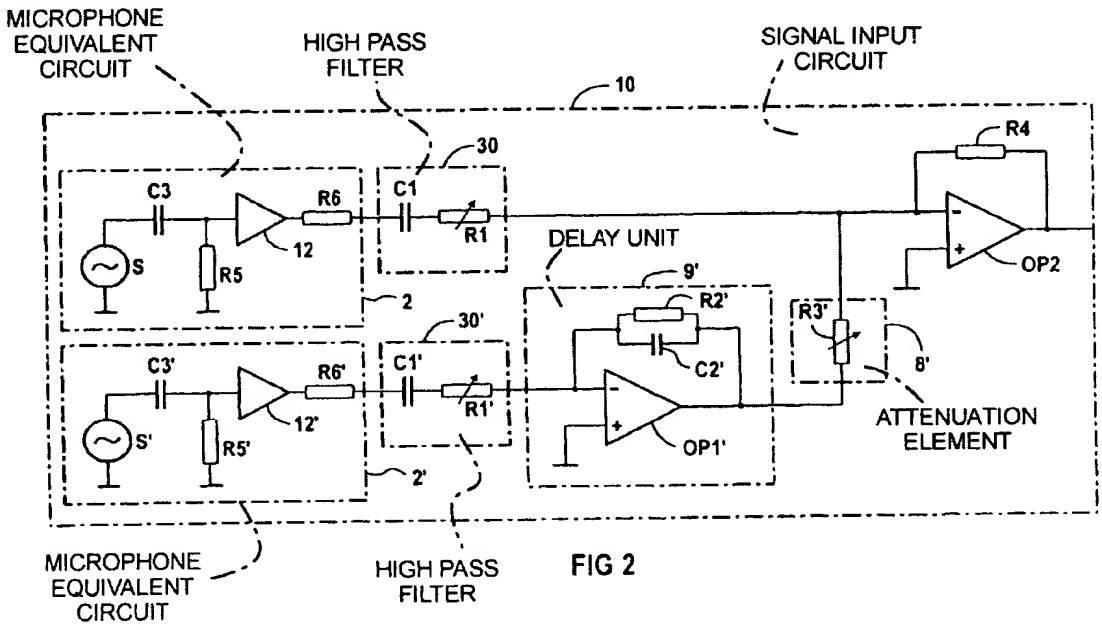

FIG. 2 OF ARNDT

For instance, Arndt teaches that "[i]n accordance with the invention the two high-pass filters 30 and 30' are matched in their limit frequencies to the limit frequencies of the preceding microphones in contrast to known circuits."[57]

Arndt further teaches that "[f]or this purpose, in the exemplary embodiment, the values of the programmable resistors R1 and R1' are selected such that the limit frequency of the microphone 2 corresponds to the limit frequency of the high-pass filter 30' and the limit frequency of the microphone 2' corresponds to the limit frequency of the high-pass filter 30. Thus, in a simple manner, it is possible to balance manufacturing related variation of the limit

[56] Arndt, col. 2, ll. 46-49 (emphasis added).
[57] Arndt, col. 4, ll. 40-43 (emphasis added).

frequencies of the microphones used."[58] In other words, the resistor R1 of high-pass filter 30, which corresponds to the first microphone 2, is selected to match the limit frequency of the second microphone 2'. Thus, the function of the high-pass filters 30 and 30' is to respectively match the limit frequencies of the microphone corresponding to the other high-pass filter (*i.e.*, high-pass filters 30' and 30, respectively) in order to control the amplitude response and/or phase response (*i.e.*, the directivity pattern) of the two microphones, not to prevent low frequency components from reaching a sigma-delta modulator, as claimed in independent claim 1. See Arndt's Abstract.

As such, Appellants maintain that Arndt fails to teach, or suggest, "the filter means preventing low frequency components from reaching the sigma-delta modulator" as recited in independent claim 1.

b. Position of Arndt's High-Pass Filters

In addition to above, Appellants submit that Arndt teaches that the two microphones 2 or 2' each are illustrated by a microphone equivalent circuit, as shown above in FIG. 2 of Arndt. Appellants note that the high-pass filters 30 and 30' are positioned outside of the microphone equivalent circuits 2 and 2' as indicated by the dashing line surrounding elements S, C3, R5, R6 and 12.

Thus, contrary to the Examiner's assertion, Appellants submit that the Arndt also fails to teach, or suggest, a microphone assembly including a filter means as similarly recited in independent claim 1.

c. Lack of Motivation to Combine Arndt's High-Pass Filters with Martin's Digital Hearing Aid

As discussed above, Appellants submit that the function of the high-pass filters 30 and 30' of Arndt is to respectively match the limit frequencies of the other microphone for amplitude response and/or phase response of the two microphones.

Appellants further submit that Martin discloses a digital hearing aid with one microphone. Therefore, Appellants submit that one of ordinary skill in the art would not be motivated to combine Arndt's high-pass filters, which are intended to match the limit frequencies of two microphones in a directional hearing aid, with Martin's digital hearing aid

[58] Arndt, col. 4, ll. 43-51.

that includes only one microphone. Including an adjustable high-pass filter in Martin's digital hearing aid would serve no useful purpose because there is no second microphone to which the amplitude response and/or phase response of the existing microphone must be matched.

Appellants submit that the combination of Martin and Arndt fails to motivate one of ordinary skill in the art to provide a filter means, as taught by Arndt, between the preamplifier 8 and the A/D converter 7 in the microphone housing 6 taught by Martin.

d. The Combination of Martin and Arndt Fails to Render Claim 1 Obvious

In order to prevent "low frequency components from reaching the sigma-delta modulator" as recited in independent claim 1, the combination of Martin and Arndt would motivate one having ordinary skill in the art to place a small hole in the membrane of the microphone as taught by Arndt, not a "filter means in the signal path between the pre-amplifier and the sigma-delta modulator" as recited in independent claim 1.

For at least the reasons discussed above, Appellants submit that Arndt fails to cure the deficiencies of Martin with respect to independent claim 1.

Furthermore, even assuming *arguendo* that the references could be combined, Martin in view of Arndt would still fail to teach, or suggest, a microphone assembly including a "filter means in the signal path between the pre-amplifier and the sigma-delta modulator, the filter means preventing low frequency components from reaching the sigma-delta modulator" as recited in independent claim 1.

As such, Appellants submit that the alleged combination of Arndt and Martin does not render independent claim 1 *prima facie* obvious.

VIII. CONCLUSION

Appellants respectfully request that the Board reverse the Examiner's obviousness rejection of claims 1, 5, 7, 17, 18, 36 and 38 in view of Martin and Arndt.

The Commissioner is authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

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Attachments: IX. Claims Appendix
IIX. Evidence Appendix
IIIX. Related Proceeding Appendix

IX. CLAIMS APPENDIX

1. A microphone assembly comprising

- a microphone assembly casing having a sound inlet port,
- a transducer for receiving acoustic waves through the sound inlet port, and for converting received acoustic waves to analog audio signals, said transducer being positioned within the microphone assembly casing,
- an electronic circuit positioned within the microphone assembly casing, said electronic circuit comprising a signal path defined by a cascade of
  - a pre-amplifier for amplifying analog audio signals from the transducer, and
  - a sigma-delta modulator for providing digital audio signals,

wherein the microphone assembly further comprises filter means in the signal path between the pre-amplifier and the sigma-delta modulator, the filter means preventing low frequency components from reaching the sigma-delta modulator.

5. A microphone assembly according to claim 1, wherein the filter means is a high-pass filter.

7. A microphone assembly according to claim 1, wherein the pre-amplifier, the sigma-delta modulator, and at least part of the filter means are integrated on a chip so as to form a monolithic integrated circuit.

17. A portable unit comprising

- a microphone assembly according to claim 1, said microphone assembly being connected to a pure digital signal processor for further signal processing.

18. A portable unit according to claim 17, wherein the portable unit is selected from the group consisting of hearing aids, assistive listening devices, mobile recording units, such as MP3 players; and mobile communication units, such as mobile or cellular phones.

36. A microphone assembly according to claim 1, wherein the filter means is a band-pass filter.

38. A microphone assembly according to claim 5, wherein the amplifier forms part of a monolithic integrated circuit further comprising the pre-amplifier, at least part of the filter means and the sigma-delta modulator.

IIX. EVIDENCE APPENDIX

NONE

IIIX. RELATED PROCEEDINGS APPENDIX

NONE